Preparing for the

TENNESSEE

End of Course Assessment

Physical Science

Contents

Preparing for the
End of Course Assessment Program
Physical Science

Introduction

What is this test?

The *Tennessee End of Course Assessment Program* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. The sample questions in this pamphlet are representative of the item types and item formats that will be used in the actual test.

What are the questions testing?

The questions assess the content standards covered by each course as described in the performance indicators developed by the Tennessee State Department of Education and listed on their Web site.

Who will be tested?

All students taking Physical Science will be tested. Tests may be given midyear for block schedules or at the end of the year.

How many questions are there?

Each test contains 60 multiple-choice questions.

How long will the tests take?

Students will have ample time to read and answer each of the questions. Each test will take approximately 90 minutes to complete.

How will the tests be scored?

The answers to the multiple-choice questions will be scored by machine. The test results provide information about how well students understand the course content.

How do I use these sample questions?

The questions in the pamphlet are, for the most part, representative samples of the types of questions that will be on the Physical Science test. The questions are presented in a format similar to that which will be used in the actual test. Reporting Categories and Performance Indicators have been provided for the questions in this pamphlet only.

These Reporting Categories group the Physical Science Performance Indicators together. When students receive their reports from the test, these Reporting Categories will be used to report scores on student performance. The questions in the actual test will not have this identifying information.

These questions can be used for a classroom learning session or as an individual, short practice test to prepare students for the actual test. Various item formats have been selected in order to familiarize students with the actual test format.

The items in this Preparation Brochure will **not** be found on the End of Course tests. The number of items in this Preparation Brochure does not reflect the emphasis of content on the test.

An answer key for the sample questions is provided at the end of this pamphlet.

What tips are there for taking the test?

RELAX: It is normal to be somewhat nervous before the test. Remember that the score is only one of a number of measures of your performance.

LISTEN: Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them. Follow the directions.

PLAN YOUR TIME: Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later if you have extra time. First answer all the questions you are sure about.

THINK: If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Physical Science Formula Page

Velocity $\qquad v = \dfrac{d}{t}$

Where
  v = velocity in meters per second (m/s)
  d = distance in meters (m)
  t = time in seconds (s)

Acceleration $\qquad a = \dfrac{\Delta v}{t}$

Where
  a = acceleration in meters per second per second (m/s^2)
  Δv = change in velocity in meters per second (m/s)
  t = time in seconds (s)

Force $\qquad F = ma$

Where
  F = force in newtons (N)
  m = mass in kilograms (kg)
  a = acceleration in meters per second per second (m/s^2)

Work $\qquad W = Fd$

Where
  W = work in joules (J)
  F = force in newtons (N)
  d = distance in meters (m)

Power $\qquad P = \dfrac{W}{t}$

Where
  P = power in watts (W)
  W = work in joules (J)
  t = time in seconds (s)

Density $\qquad D = \dfrac{m}{V}$

Where
  D = density in grams per centimeter cubed (g/cm^3)
      or grams per milliliter (g/mL)
  m = mass in grams (g)
  V = volume in centimeters cubed (cm^3) or milliliters (mL)

Ideal Gas Laws

Boyle's Law $\qquad P_1V_1 = P_2V_2$

Where
  P_1 = initial pressure
  V_1 = initial volume
  P_2 = final pressure
  V_2 = final volume

Combined Gas Law $\qquad \dfrac{P_1V_1}{T_1} = \dfrac{P_2V_2}{T_2}$

Where
  P_1 = initial pressure
  V_1 = initial volume
  T_1 = initial temperature in kelvin
  P_2 = final pressure
  V_2 = final volume
  T_2 = final temperature in kelvin

Charles' Law $\qquad \dfrac{V_1}{T_1} = \dfrac{V_2}{T_2}$

Where
  V_1 = initial volume
  T_1 = initial temperature in kelvin
  V_2 = final volume
  T_2 = final temperature in kelvin

Heat Lost or Gained $\qquad Q = mc\Delta T$

Where
  m = mass in kilograms (kg)
  c = specific heat capacity in
      joules per kilogram kelvin (J/kgK)
  ΔT = change in temperature in kelvin

Ideal Mechanical Advantage $\qquad IMA = \dfrac{D_e}{D_r}$

Where
  IMA = ideal mechanical advantage
  D_e = effort distance in meters (m)
  D_r = resistance distance in meters (m)

Actual Mechanical Advantage $\qquad AMA = \dfrac{F_r}{F_e}$

Where
  AMA = actual mechanical advantage
  F_r = resistance force in Newtons (N)
  F_e = effort force in Newtons (N)

% Efficiency $\qquad \% \text{ Efficiency} = \dfrac{W_{out}}{W_{in}}$

Where
  W_{out} = work output
  W_{in} = work input

Electricity $\qquad$ Ohm's Law $V = IR$

Where
  V = electrical potential in volts (V)
  I = current in amperes (A)
  R = resistance in ohms (Ω)

Periodic Table of the Elements

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1 hydrogen **H** 1.01																	2 helium **He** 4.003
	3 lithium **Li** 6.941	4 beryllium **Be** 9.012											5 boron **B** 10.811	6 carbon **C** 12.011	7 nitrogen **N** 14.007	8 oxygen **O** 15.999	9 fluorine **F** 18.998	10 neon **Ne** 20.18
	11 sodium **Na** 22.99	12 magnesium **Mg** 24.305											13 aluminum **Al** 26.982	14 silicon **Si** 28.086	15 phosphorus **P** 30.974	16 sulfur **S** 32.065	17 chlorine **Cl** 35.453	18 argon **Ar** 39.948
	19 potassium **K** 39.098	20 calcium **Ca** 40.078	21 scandium **Sc** 44.956	22 titanium **Ti** 47.867	23 vanadium **V** 50.942	24 chromium **Cr** 52.01	25 manganese **Mn** 54.938	26 iron **Fe** 55.85	27 cobalt **Co** 58.933	28 nickel **Ni** 58.693	29 copper **Cu** 63.546	30 zinc **Zn** 65.38	31 gallium **Ga** 69.723	32 germanium **Ge** 72.64	33 arsenic **As** 74.922	34 selenium **Se** 78.96	35 bromine **Br** 79.904	36 krypton **Kr** 83.81
	37 rubidium **Rb** 85.468	38 strontium **Sr** 87.62	39 yttrium **Y** 88.906	40 zirconium **Zr** 91.224	41 niobium **Nb** 92.906	42 molybdenum **Mo** 95.94	43 technetium **Tc** 97.9	44 ruthenium **Ru** 101.07	45 rhodium **Rh** 102.91	46 palladium **Pd** 106.42	47 silver **Ag** 107.87	48 cadmium **Cd** 112.41	49 indium **In** 114.82	50 tin **Sn** 118.71	51 antimony **Sb** 121.76	52 tellurium **Te** 127.61	53 iodine **I** 126.9	54 xenon **Xe** 131.291
	55 cesium **Cs** 132.905	56 barium **Ba** 137.327	57 lanthanum **La** 138.91	72 hafnium **Hf** 178.49	73 tantalum **Ta** 180.95	74 tungsten **W** 183.85	75 rhenium **Re** 186.207	76 osmium **Os** 190.23	77 iridium **Ir** 192.22	78 platinum **Pt** 195.08	79 gold **Au** 196.97	80 mercury **Hg** 200.59	81 thallium **Tl** 204.38	82 lead **Pb** 207.2	83 bismuth **Bi** 208.98	84 polonium **Po** 209	85 astatine **At** 210	86 radon **Rn** 222
	87 francium **Fr** 223	88 radium **Ra** 226	89 actinium **Ac** 227	104 rutherfordium **Rf** 261	105 dubnium **Db** 262	106 seaborgium **Sg** 266	107 bohrium **Bh** 264	108 hassium **Hs** 277	109 meitnerium **Mt** 268	110 ununnilium **Uun** 281	111 unununium **Uuu** 272	112 ununbium **Uub** 285						

58 cerium **Ce** 140.12	59 praseodymium **Pr** 140.91	60 neodymium **Nd** 144.24	61 promethium **Pm** 145	62 samarium **Sm** 150.36	63 europium **Eu** 151.97	64 gadolinium **Gd** 157.25	65 terbium **Tb** 158.93	66 dysprosium **Dy** 162.5	67 holmium **Ho** 164.93	68 erbium **Er** 167.26	69 thulium **Tm** 168.93	70 ytterbium **Yb** 173.04	71 lutetium **Lu** 174.97
90 thorium **Th** 232.04	91 protactinium **Pa** 231.04	92 uranium **U** 238.03	93 neptunium **Np** 237	94 plutonium **Pu** 244	95 americium **Am** 243	96 curium **Cm** 247	97 berkelium **Bk** 247	98 californium **Cf** 251	99 einsteinium **Es** 252	100 fermium **Fm** 257	101 mendelevium **Md** 258	102 nobelium **No** 259	103 lawrencium **Lr** 262

Reporting Category: **Force and Motion**
Numbers 1 through 12

Performance Indicator: The student is able to distinguish between speed and velocity, given a scenario.

1   **Which of these best represents a velocity?**

   A   A racecar speeds along a track at 300 km/hr.
   B   Light travels at 3×10^8 m/s.
   C   The wind is blowing from the northwest at 7 km/hr.
   D   The tennis champion serves the ball in excess of 130 km/hr.

   EP000065

Performance Indicator: The student is able to relate inertia, force, or action-reaction forces to Newton's three laws of motion given an illustration, diagram, or scenario.

2   **Which of these best represents an action-reaction pair of forces?**

   F   An object is accelerated across a smooth surface.
   G   An object increases in speed as it falls.
   H   A student pushes on a wall and the wall pushes back on the student.
   J   An object remains at rest for an hour.

   EP000086

Performance Indicator: The student is able to distinguish between mass and weight using SI units, given examples.

3   **A 60-kilogram object from Earth is sent to the Moon. What is the mass of this object when it is on the Moon?**
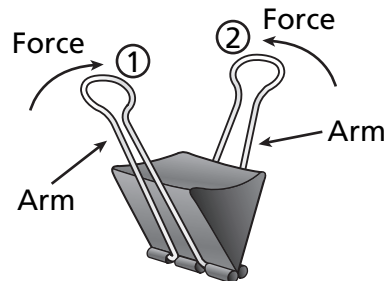
   A   10 newtons
   B   10 kilograms
   C   60 newtons
   D   60 kilograms

   EP000089

Performance Indicator: The student is able to identify simple machines, given illustrations of machines in action.
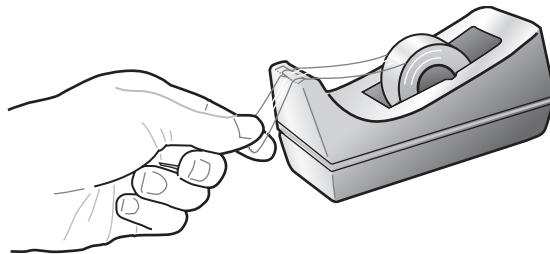
4 **A clamp is shown below.**

When a force is applied to positions 1 and 2 simultaneously, the arms of this clamp act like a pair of

F   levers

G   wedges

H   inclined planes

J   wheels and axles

EP000106

5 **A tape dispenser is shown below.**
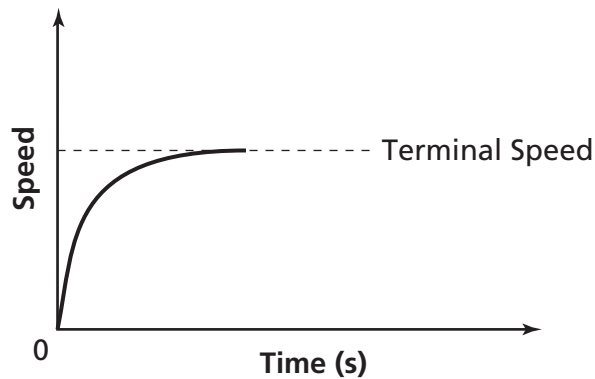

The edge of the dispenser where the tape is separated from the roll is <u>most</u> like a

A   lever

B   wheel and axle

C   screw

D   wedge

EP005002

Performance Indicator: The student is able to interpret a distance-time graph for velocity or a velocity-time graph for acceleration, given the appropriate graph.

6 **The graph below represents a change in speed over time.**

The graph most likely represents

F an airplane touching down on a runway

G a ball moving upward in the air

H an apple falling from a tree

J a ball dropped from a tall cliff

EP005028

Performance Indicator: The student is able to solve application problems related to velocity, acceleration, force, work, and power, using appropriate units of measurement, given the equations.

7 **A net force of 30 newtons is applied to a 6-kilogram object. At what rate will the object accelerate?**

A 0.2 m/s^2

B 5.0 m/s^2

C 24 m/s^2

D 36 m/s^2

EP000151

8 **What force must be applied to an 8-kilogram bowling ball to accelerate it at a rate of 4 m/s²?**

F   0.5 newton

G   2 newtons

H   12 newtons

J   32 newtons

EP000171

Performance Indicator: The student is able to distinguish among the concepts inherent in Newton's three laws of motion, given a scenario.

9 **A tractor pulling a wagon travels at a constant speed. The forces on the hitch connecting the trailer to the tractor can be described by**

A   Newton's First Law of Motion: inertia

B   Newton's Law of Universal Gravitation

C   Newton's Second Law of Motion: a net force causes acceleration

D   Newton's Third Law of Motion: an action results in a reaction

EP000124

Performance Indicator: The student is able to choose the illustration or scenario that relates the effect of gravitational force on falling bodies or satellites.

10 **Under what conditions would a lead weight and a feather fall at the same rate?**

F   when the temperature is very low

G   when they are both wet

H   when there is no air resistance

J   when the air pressure is constant

EP005065

11 A soccer ball kicked into the air follows the path shown below.
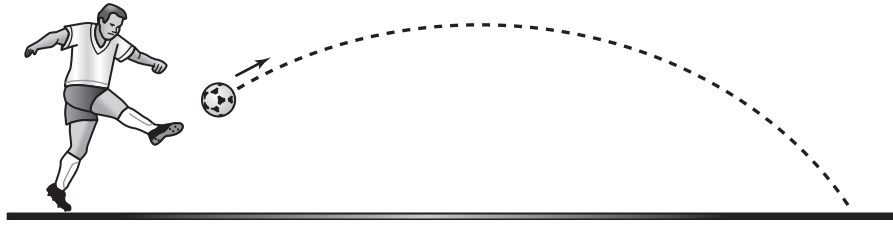
As the ball is rising in the air, how does gravity affect it?

A   Gravity causes the speed of the ball to stay the same.

B   Gravity causes the speed of the ball to increase.

C   Gravity causes the ball to accelerate upward.

D   Gravity causes the ball to accelerate downward.

EP005003

Performance Indicator: The student is able to choose the correct representation of the law of conservation of momentum, given an illustration.

12 A bowling ball is rolling along a smooth surface at 10 m/s when it collides with a single bowling pin. Which of the following <u>best</u> describes the motion immediately after collision?

F   The bowling pin must have a speed of 10 m/s.

G   The bowling pin must have a speed of 5 m/s.

H   The bowling ball must have a speed greater than 10 m/s.

J   The bowling ball must have a speed less than 10 m/s.

EP005008

Reporting Category: Structure and Properties of Matter
Numbers 13 through 22

Performance Indicator: The student is able to identify a material as a pure substance or a mixture, given a description of the material.

13   **Which of these statements best describes a characteristic of a mixture?**

   A   A mixture settles upon standing.
   B   A mixture has two or more phases.
   C   A mixture is made up only of one substance.
   D   A mixture can be separated by physical means.

   EP005077

14   **A material has the following properties:**

   •   **Its components can be separated by physical means.**
   •   **Its components are uniformly mixed at the molecular level.**

   This material would best be classified as

   F   an element
   G   a compound
   H   a homogeneous mixture
   J   a heterogeneous mixture

   EP000170

Performance Indicator: The student is able to distinguish among the phases of matter in terms of volume, shape and particle arrangement, given illustrations.

15   **A liquid has a fixed volume and takes the shape of a container. Which statement best describes this liquid on a molecular level?**

   A   Molecules are moving freely with much space between them.
   B   The atoms within the molecules in a liquid can change, and its shape can change.
   C   Attractions between molecules are strong, but molecules do not have fixed positions.
   D   Attractions between molecules are so strong that molecules cannot change their positions.

   EP000031

Performance Indicator: The student is able to distinguish among elements, compounds, solutions, colloids, and suspensions, given examples.

16 **When raw milk is homogenized, butterfat particles are reduced in size so that they do not rise to the top as cream. The fat particles are still larger than molecules of fat, and they act to scatter light that strikes the milk. Because of the homogenization process, homogenized milk is most commonly considered to be a**

    F   colloid

    G   compound

    H   strong base

    J   saturated solution

Performance Indicator: The student is able to distinguish between metals and nonmetals, given examples.

17 **In which part of the periodic table of the elements are nonmetals grouped?**

    A   the upper left

    B   the lower left

    C   the upper right

    D   the lower center

EP000179

Performance Indicator: The student is able to identify chemical formulas for common compounds (i.e. H_2O, NaCl, CO_2, HCl, Fe_2O_3, $C_6H_{12}O_6$, NaOH).

18 **Which formula represents hydrochloric acid?**

F HCl

G H_2ClO_4

H CH_3COOH

J CH_4

EP000156

Performance Indicator: The student is able to solve application problems related to density, mass, and volume, given the equation.

19 **An Arctic researcher determines the volume of an iceberg sample to be 100 cm^3 and the mass to be 96 g. What is the density of the sample?**

A 104 g/cm^3

B 96 g/cm^3

C 1.04 g/cm^3

D 0.96 g/cm^3

EP005117

Performance Indicator: The student is able to predict the behavior of an object in a fluid, given its relative density.

20 **Which statement explains why bubbles of carbon dioxide rise to the top of a bottle of carbonated water when the bottle is opened?**

F The mass of carbon dioxide bubbles is less than the mass of water.

G The density of carbon dioxide bubbles is less than the density of water.

H The volume of carbon dioxide bubbles is less than the volume of water.

J The pressure from carbon dioxide bubbles is less than the pressure of water.

EP005084

Performance Indicator: The student is able to identify the atomic number, atomic mass, number of protons, number of neutrons, and number of electrons in an atom of a given element, using the periodic table.

21 **Based on the periodic table of the elements, which is the symbol for the element that has 40 protons?**

A Ca

B Zr

C He

D Ar

EP005068

22 **Based on the periodic table of the elements, how many protons and electrons are in a neutral atom of argon (Ar)?**

F 18 protons and 18 electrons

G 40 protons and 40 electrons

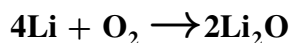**H** 18 protons and 40 electrons

J 40 protons and 18 electrons

EP005069

Reporting Category: Interactions of Matter
Numbers 23 through 29

Performance Indicator: The student is able to identify the reactants and/or products in a chemical reaction, given a chemical equation.

23 **The chemical equation below shows the reaction of lithium and oxygen.**

$$4Li + O_2 \longrightarrow 2Li_2O$$

Which of these identifies all the products or the product of this reaction?

A   Li

B Li_2O

C   Li and O_2

D   Li, O_2, and Li_2O

EP005133

Performance Indicator: The student is able to identify a substance as acidic, basic, or neutral, given its pH.

24 **Which of these liquids has a basic pH?**

F   seawater (pH$=$8.5)

G   rainwater (pH$=$6.2)

H   distilled water (pH$=$7.0)

J   carbonated water (pH$=$3.0)

EP000118

Performance Indicator: The student is able to distinguish between endothermic and exothermic reactions, given a description of the temperature change in a reaction.

25 **Which of these processes is endothermic?**

    A   gasoline burning in the engine of a car

    B   dew evaporating in the warm sunlight

    C   an animal converting stored energy to motion

   **D**   decaying vegetation heating the center of a compost pile

EP005163

26 **Which of these describes an exothermic chemical reaction?**

    F   a reaction that absorbs heat while the temperature remains the same

    G   a reaction that requires a catalyst to change the temperature

    H   a reaction in which the energy is absorbed and the surrounding temperature decreases

    J   a reaction in which the energy is released and the surrounding temperature increases

EP005166

Performance Indicator: The student is able to identify a chemical reaction as synthesis, decomposition, single-replacement or double-replacement, given an equation.

27 **A strong acid reacts with a strong base to produce a salt and water, as shown below.**

$$HCl + NaOH \longrightarrow NaCl + H_2O$$
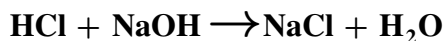
What type of reaction is this?

    A   synthesis

    B   decomposition

    C   single replacement

    D   double replacement

EP000067

Performance Indicator: The student is able to identify the effect of acid rain on the environment, given a scenario.

28 **What is the effect of acid rain on limestone buildings and monuments?**

    F   The limestone absorbs acid and turns to water.

    G   The limestone absorbs water and becomes soft.

    H   The acid causes the limestone surface to turn green.

    J   The acid reacts with the limestone and scars the surface.

EP000167

Performance Indicator: The student is able to apply the law of conservation of mass in a chemical reaction by selecting the balanced equation.

**29** **Which of these chemical equations is balanced?**

    A $H_2 + O_2 \longrightarrow H_2O$

    B $KClO_3 \longrightarrow KCl + O_2$

    C $ZnCO_3 \longrightarrow ZnO + CO_2$

    D $SO_2 + O_2 \longrightarrow SO_3$

EP005148

Reporting Category: Energy
Numbers 30 through 40

Performance Indicator: The student is able to classify a wave as transverse or longitudinal, given a description or an illustration.

30 **Which of these diagrams illustrates a transverse wave?**

F
Earthquake

Epicenter

Focus
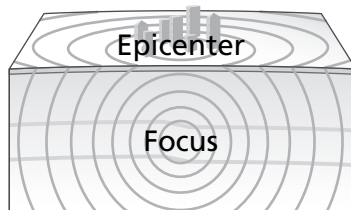
Particle movement ←→ ←→

Wave direction ←—— ——→

H
Coiled Spring

Particle movement ←——→

Wave direction ———→

G
Tuning Fork
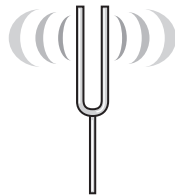
Particle movement ←→ ←→

Wave direction ←—— ——→

J
Rope

Particle movement ↕

Wave direction ←———

EP000085

Performance Indicator: The student is able to identify wavelength, frequency and amplitude, given a description or an illustration.

31 **The diagram below represents waves moving from point P to point Q.**

Direction ➝

30 seconds

P   Q
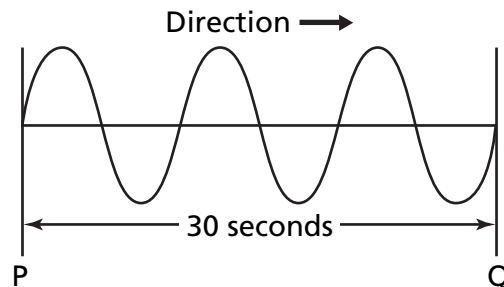
If the waves move from point P to point Q in 30 seconds and frequency is the measure of waves per time, then what is the wave frequency?

A $0.1 \dfrac{\text{waves}}{\text{second}}$

B $1 \dfrac{\text{waves}}{\text{second}}$

C $10 \dfrac{\text{waves}}{\text{second}}$

D $100 \dfrac{\text{waves}}{\text{second}}$

EP000090

Performance Indicator: The student is able to identify the boiling and/or freezing point of water, given the Celsius, Fahrenheit, or Kelvin temperature scales.
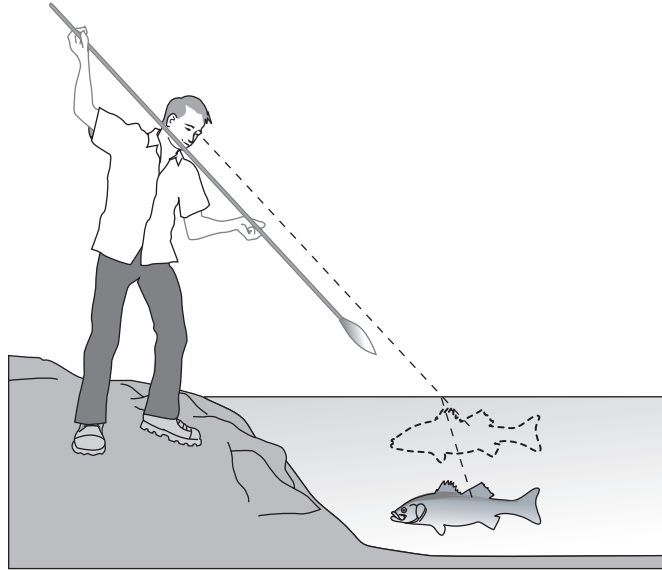
32 **What are the boiling and freezing points of water in Kelvin?**

F   212 and 32

G   100 and 0

H   373 and 273

J   212 and 0

EP005199

Performance Indicator: The student is able to identify a wave's behavior as reflection, refraction, diffraction, or interference, given an example.

33 The inexperienced spear fisher, shown below, is likely to miss the fish.

The wave phenomenon responsible for changing the path of light leaving the water is

A refraction

B reflection

C diffraction

D absorption

EP000173

Performance Indicator: The student is able to classify sound as a longitudinal, mechanical wave and light as a transverse, electromagnetic wave, given an illustration.

34 A student claps her hands together while facing a rock cliff and hears an echo. This echo is a result of

F a transverse, electromagnetic wave absorbing energy from the cliff

G a transverse, electromagnetic wave diffracting around the cliff walls

H a longitudinal, mechanical wave reflecting back from the surface of the cliff

J a longitudinal, mechanical wave refracting through the solid walls of the cliff

EP000051

Performance Indicator: The student is able to classify the transfer of heat energy is conduction, convection or radiation, given an example.

35 **A student opens the door of a warm oven and feels the air warming his face. He then touches the metal tray inside the oven and slightly burns his fingers. Which statement <u>best</u> explains what happens?**

A The student's face was heated by convection and his fingers were burned because of heat conduction.

B The student's face was heated by conduction and his fingers were burned because of heat radiation.

C The student's face was heated because of radiation and his fingers were burned because of heat convection.

D The student's face was heated because of convection and his fingers were burned because of heat radiation.

EP005243

Performance Indicator: The student is able to compare and contrast the four kinds of wave interactions *(reflection, diffraction, refraction, and interference)*.

36 **When a wave approaches a barrier and reflects, the wave**

F bounces away from the barrier

G transfers through the barrier

H travels around the barrier

J is absorbed by the barrier

EP005227

Performance Indicator: The student is able to solve application problems related to voltage, resistance, and current in a series circuit, given the equation.

37 **A 45-volt (V) electrical circuit conducts a current. The resistance (R) of the circuit is 50.0 ohms. Given the equation $V = IR$, what is the amount of current (I) in the circuit?**

A 0.11 ampere

B 0.90 ampere

C 50.0 amperes

D 225 amperes

EP005244

Performance Indicator: The student is able to distinguish between nuclear fission and nuclear fusion, given a scenario.

38 **Which of these results from a fusion reaction?**

    F   energy from the sun

    G   energy from a nuclear power plant

    H   radioactive decay in the nucleus of an atom

    J   large atoms becoming smaller atoms

EP005236

Performance Indicator: The student is able to select the scenario that represents the law of conservation of energy, given an illustration.

39 **A food source provides an athlete 1,000,000 J of energy. If 700,000 J of energy are used during an activity, which statement is correct according to the law of conservation of energy?**

    A   1,000,000 J of energy are stored in the body of the athlete.

    B   700,000 J of energy are stored in the body of the athlete.

    C   1,700,000 J of energy are stored in the body of the athlete.

    D   300,000 J of energy are stored in the body of the athlete.

EP005247

Performance Indicator: The student is able to solve problems regarding heat, mass, specific heat capacity, and temperature change, given the equation.

40 The relationship among heat, mass, and temperature is shown below.

$$Q = mc\Delta T, \text{ where}$$
$$Q = \text{heat lost or gained in joules}$$
$$m = \text{mass in kilograms}$$
$$c = \text{specific heat capacity in joules/kg°C}$$
$$\Delta T = \text{temperature change in °C}$$

If the specific heat capacity of water is **4.19 J/g°C**, how much heat energy is lost when 1 kilogram of water cools from **15.0°C** to **12.0°C**?

F   4,190 joules

G   12,700 joules

H   41,900 joules

J   12,570 joules

EP000213

Answer Key

Reporting Category:		Force and Motion
Item Number	**Correct Answer**	**Performance Indicator**
1	C	The student is able to distinguish between speed and velocity, given a scenario.
2	H	The student is able to relate inertia, force, or action-reaction forces to Newton's three laws of motion given an illustration, diagram, or scenario.
3	D	The student is able to distinguish between mass and weight using SI units, given examples.
4	F	The student is able to identify simple machines, given illustrations of machines in action.
5	D	The student is able to identify simple machines, given illustrations of machines in action.
6	J	The student is able to interpret a distance-time graph for velocity or a velocity-time graph for acceleration, given the appropriate graph.
7	B	The student is able to solve application problems related to velocity, acceleration, force, work, and power, using appropriate units of measurement, given the equations.
8	J	The student is able to solve application problems related to velocity, acceleration, force, work, and power, using appropriate units of measurement, given the equations.
9	D	The student is able to distinguish among the concepts inherent in Newton's three laws of motion, given a scenario.
10	H	The student is able to choose the illustration or scenario that relates the effect of gravitational force on falling bodies or satellites.
11	D	The student is able to choose the illustration or scenario that relates the effect of gravitational force on falling bodies or satellites.
12	J	The student is able to choose the correct representation of the law of conservation of momentum, given an illustration.

Reporting Category:		Structure and Properties of Matter
Item Number	**Correct Answer**	**Performance Indicator**
13	D	The student is able to identify a material as a pure substance or a mixture, given a description of the material.
14	H	The student is able to identify a material as a pure substance or a mixture, given a description of the material.
15	C	The student is able to distinguish among the phases of matter in terms of volume, shape and particle arrangement, given illustrations.
16	F	The student is able to distinguish among elements, compounds, solutions, colloids, and suspensions, given examples.
17	C	The student is able to distinguish between metals and nonmetals, given examples.
18	F	The student is able to identify chemical formulas for common compounds (i.e. H_2O, $NaCl$, CO_2, HCl, Fe_2O_3, $C_6H_{12}O_6$, $NaOH$).
19	D	The student is able to solve application problems related to density, mass, and volume, given the equation.
20	G	The student is able to predict the behavior of an object in a fluid, given its relative density.
21	B	The student is able to identify the atomic number, atomic mass, number of protons, number of neutrons, and number of electrons in an atom of a given element, using the periodic table.
22	F	The student is able to identify the atomic number, atomic mass, number of protons, number of neutrons, and number of electrons in an atom of a given element, using the periodic table.

Answer Key

Reporting Category:		Interactions of Matter
Item Number	**Correct Answer**	**Performance Indicator**
23	B	The student is able to identify the reactants and /or products in a chemical reaction, given a chemical equation.
24	F	The student is able to identify a substance as acidic, basic, or neutral, given its pH.
25	B	The student is able to distinguish between endothermic and exothermic reactions, given a description of the temperature change in a reaction.
26	J	The student is able to distinguish between endothermic and exothermic reactions, given a description of the temperature change in a reaction.
27	D	The student is able to identify a chemical reaction as synthesis, decomposition, single-replacement or double-replacement, given an equation.
28	J	The student is able to identify the effect of acid rain on the environment, given a scenario.
29	C	The student is able to apply the law of conservation of mass in a chemical reaction by selecting the balanced equation.

Answer Key

Reporting Category:		Energy
Item Number	**Correct Answer**	**Performance Indicator**
30	J	The student is able to classify a wave as transverse or longitudinal, given a description or an illustration.
31	A	The student is able to identify wavelength, frequency and amplitude, given a description or an illustration.
32	H	The student is able to identify the boiling and/or freezing point of water, given the Celsius, Fahrenheit, or Kelvin temperature scales.
33	A	The student is able to identify a wave's behavior as reflection, refraction, diffraction, or interference, given an example.
34	H	The student is able to classify sound as a longitudinal, mechanical wave and light as a transverse, electromagnetic wave, given an illustration.
35	A	The student is able to classify the transfer of heat energy is conduction, convection or radiation, given an example.
36	F	The student is able to compare and contrast the four kinds of wave interactions *(reflection, diffraction, refraction, and interference)*.
37	B	The student is able to solve application problems related to voltage, resistance, and current in a series circuit, given the equation.
38	F	The student is able to distinguish between nuclear fission and nuclear fusion, given a scenario.
39	D	The student is able to select the scenario that represents the law of conservation of energy, given an illustration.
40	J	The student is able to solve problems regarding heat, mass, specific heat capacity, and temperature change, given the equation.